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ABSTRACT

This document contains 29 programs and/or material listings that were nominated by at least three persons and for which there was evidence of the quality of the program or materials. Reviewers looked for positive evaluation data on the impact of the materials on students, or other information that assessed the quality of the program or materials, or both. This resulted in a selected listing of programs and materials. Print and/or nonprint materials for students' use also had to be available. Programs and materials are listed in three sections: Elementary-Secondary (K-12), Elementary (K-9), Middle, High School, and Colleg . Program titles include: (1) "Add-Ventures for Girls": "Building Math Confidence"; (2) "EQUALS"; (3) "Family Math"; (4) "Florida Middle Grades Mathematics Instructional Model"; (5) "Great Exploration in Math and Science (GEMS)"; (6) "Activities to Integrate Mathematics and Science (AIMS)"; (7) "Figure Out"; (8) "Integrating Science, Math, and Technology (K-6)"; (9) "It Figures"; (10) "Instructional System in Mathematics (ISM)"; (11) "Jostens Learning Mathematics Curriculum"; (12) "LINK: A Middle School Math/Science Program for Excellence"; (13) "Math Their Way"; (14) "Math Works"; (15) "Project SEED"; (16) "Solve It"; (17) "TERC Used Numbers Project: Collecting and Analyzing Real Data"; (18) "Think About", (19) "The Algebra Project"; (20) "Applied Mathematics"; (21) "Contemporary Precalculus through Applications"; (22) "Early Placement Evaluation in Mathematics (EPEM)"; (23) "Fifth-Year Math Program"; (24) "Math A--Fresno Unified School District"; (25) "Practical Mathematics I and II"; (26) "Teaching Remedial Mathematics to Students with Learning Disabilities"; and (27) "University or Chicago School Mathematics Project." Each section includes the title, source(s), audience, description, production date, evaluation and/or comments, materials available, and the address of a contact person. Four resource organizations and 11 references are listed. (KR)

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PROMISING AND EXEMPLARY PROGRAMS AND MATERIALS IN ELEMENTARY AND SECONDARY SCHOOLS - MATHEMATICS

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OERI

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PROMISING AND EXEMPLARY PROGRAMS AND MATERIALS FOR ELEMENTARY AND SECONDARY SCHOOLS - MATHEMATICS

Introduction

Many school staff and their client communities are concerned about pupil achievement, skills, and attitudes related to mathematics. To respond to these concerns, staff need to determine how they can improve their mathematics programs by modifying the content and skills emphasized in the curriculum, changing or supplementing instructional materials, and changing instructional approaches, and changing the use of technology.

What should be included in an elementary and secondary school mathematics program?

There are several publications available to use to determine what a mathematics program should include. Several states including Florida, California, Michigan, New York, and Wisconsin have produced state guides or frameworks suggesting what should be included in a good elementary school mathematics program. The National Council of Teachers of Mathematics has developed Curriculum and Evaluation Standards (1989) that reflect a vision of what a mathematics program should be. Suggestions for implementing the standards are included.

In addition to the state and national frameworks and standards, several of the curriculum development projects, such as the University of Chicago School Mathematics Project, have developed frameworks and descriptions of their programs that can serve as sources of ideas.

What materials are available that have been evaluated for their impact on student performance?

The National Diffusion Network (NDN)

The NDN provides funds to disseminate exemplary programs and materials. Before a program can be included in the NDN program, it must be approved by a review group, the Program Effectiveness Panel. A program requesting a review must provide evaluation data that indicate the program was effective in the school in which it was developed or field tested and that it could be used successfully in other schools.

Programs or materials that are judged effective are summarized in the Department of Education publication *Education Programs That Work* (Education Programs..., 1988); updated editions are produced periodically. Elementary school mathematics programs in the most recent edition include: Astra's Magic Math, a program for kindergarten students; Classmate 88 Mathematics Computational Skills Program, a program to improve the basic mathematical computational skills of economically disadvantaged children; Comprehensive School Mathematics Program, grades K-6; Cross-Aged Structured Tutoring Program for Math, grades 2-8; Diagnostic Prescriptive Arithmetic, grades 3-5; First Level Mathematics (KINDER MATH), kindergarten or grade 1; HOSTS Math, for remedial math grades 2-6; Individualized Prescriptive Arithmetic Skills System, grades 5 and 6, Systematic Teaching and Measuring Mathematics, grades K-8; Success Understanding Mathematics, grades 2-6; TEAM Accelerated Mathematics, grades 3-6; Title I Mathematics Computer Assisted Instruction, grades 3-6; and Mathematics Achievement Program, grades 2-5.

Secondary mathematics programs included in the 1988 publication are: (1) Calculator Math, a supplementary program for grades 7-9; (2) CAMEL: Calculator Assisted Mathematics for Everyday Living, a curriculum to increase the skills of general mathematics students; (3) Competency Based Program for Mathematics Mastery, an individualized diagnostic/prescriptive remedial math program for grades 7-8; (4) Conceptually Oriented Mathematics Program, an outcome- based objective-oriented mastery program for grades 1-8 which has also been used in grades 9-12; (5) Cross-Aged Structured Tutoring Program for Math, a pull-out program for grades 2-8; (6) Decision-Making Math, a program for improving problem-solving skills in grades 7-9; (7) HOSTS Math: Help One Student to Succeed, a diagnostic/prescriptive/individualized approach which has been used successfully in middle and junior high schools; (8) Micro/Math, a problem-solving program integrating computer-based career unit for grades 7-9; (9) M2C: Math Motivational Centers, a pull-out program providing intensive remedial instruction in grade 9; (10) Project DPI, a diagnostic, prescriptive, individualized program for grades 7-9; and (11) Go-Metric: Supplemental Low-Cost Metric Curriculum, for use in grades 5-8.

The National Science Foundation (NSF)

The National Science Foundation is providing support for the development of several elementary and middle school programs. All materials developed go through trials with pupils before they are released for use by schools. Among the projects being supported are the following: (1) Development of a Logo-based Elementary School Geometry Curriculum, Kent State University, Kent, OH; (2) Used Numbers: Collecting and Analyzing Real Data, Technical Education Research Centers, Cambridge, MA; (3) Reckoning with Mathematics: Tools and Challenges for the Information Age, Educational Development Center, Newton, MA; (4) Calculators and Mathematics Project-- Los Angeles (CAMP-LA), California State University at Fullerton, Fullerton, CA; (5) K-6 Supplementary Mathematics Materials for a Technological Society, New York University, New York, NY; and (6) A Revision of the Geometry and Measurement Strands, K-6, University of Georgia, Athens, GA.

The National Science Foundation is providing support for the development of several secondary school mathematics programs. All materials developed go through trials with pupils before they are released for use by schools. A variety of programs are funded supporting course and material development. Recent projects supported are listed in the Directory of Awards (1989). Additional projects have been given support.

What are other sources of programs and materials with evaluation data?

The Educational Products Information Exchange (EPIE) is a non-profit organization that reviews and evaluates educational materials. EPIE produces a newsletter and special publications that include evaluation information on a variety of curriculum materials including mathematics. A listing of EPIE materials can be obtained by writing to EPIE.

Some of the Regional Educational Laboratories sponsored by the U.S. Department of Education produce and/or review mathematics materials. The Northwest Regional Educational Laboratory, for example, reviews and evaluates computer software, including those related to mathematics. They publish the results of their reviews on a regular basis.

States such as New York and Pennsylvania produce mathematics materials for schools that have had extensive evaluation. Some states such as California and Texas publish reviews of textbooks.

The ERIC database contains materials, descriptions of programs, and evaluation data related to many programs.

What are other sources of information about promising programs and materials?

Some programs and materials have been found to be effective for improving learning, but have not been reviewed on a formal basis by an outside organization or agency. Based on their use and reported results, they are considered promising programs and materials and worthy of consideration by others.

The National Council of Teachers of Mathematics has two publications focused on secondary school promising and exemplary programs. One considers alternative courses for secondary school mathematics (Suydam et al., 1985). Seventy-four courses are listed, with information on grade level or length, site, date first taught, students allowed to enroll, why developed, objectives, prerequisites, course it precedes, persons involved in development, materials used, community resources utilized, teaching modes, special teaching skills/experience, number of students enrolled/completing, evaluation and indication of success, changes considered; course outline with topics and time; and contact person. The other NCTM publication presents ten case studies of exemplary mathematics programs, nine of which concern middle or high schools. Descriptions are given of each program, with much detail on features which appear to make them exemplary.

The COSMOS Corporation (White, 1986) worked with the National Council of Teachers of Mathematics and other groups to identify programs and materials that were considered effective. The catalog published in 1986 contains more than 40 descriptions of programs, materials, and practices for elementary school mathematics. Programs and materials described include content modifications, use of technology (computers, calculators), mastery programs, problem-solving activities, use of manipulatives, cooperative learning,and supplemental materials. It also contains more than 40 descriptions of programs, materials and practices for secondary school mathematics.

The Title II program of the Education for Economic Security Act has supported the development of many promising programs and materials. A recent document published by the United States Department of Education contains over 80 project summaries from projects funded in 39 states and the District of Columbia. (Exemplary Projects. Mathematics-Science..., 1988). Included are several elementary and secondary school mathematics projects.

Elementary and secondary school mathematics programs and materials are also being developed with funds from the U.S. Department of Education Eisenhower Act. The Abstracts of the 1989 and 1988 Awards: Dwight D. Eisenhower Mathematics and Science National Programs (Levinson, 1989) include 14 elementary programs and 27 secondary programs with mathematics components.

There are a variety of programs and materials available that make use of new technology. Software has been and is being developed for elementary school programs. Integrated learning systems have been developed for elementary school mathematics. Distance learning programs (including the STAR School Project) also include materials for elementary school mathematics education. Linking for Learning (1989) and Online: Computers in Education (1989) describe several examples.

What is the ERIC/SMEAC Promising and Exemplary Program and Materials identification Project?

Based in requests received from school personnel for promising and exemplary program materials, the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) has contacted (1) state, county, and local coordinators and curriculum specialists for mathematics and (2) federal program staff for nominations of programs and materials they consider promising and exemplary. In addition, association programs, newsletters, journals, and materials

received at ERIC/SMEAC have been reviewed for information on programs and materials.

Information related to programs and materials that were nominated was reviewed, when additional information was needed regarding either the program or the materials, ERIC/SMEAC staff contacted the producers and/or users of the materials to obtain further information.

This document contains 29 programs and/or material listings that were nominated by at least three persons and for which there was evidence of the quality of the program or materials. Reviewers looked for positive evaluation data on the impact of the materials on students, or other information that assessed the quality of the program or materials, or both. This resulted in a selected listing of programs and materials. Print and/or nonprint materials for students' use also had to be available.

Programs and materials are listed in three sections: (1) Elementary-Secondary (K-12), (2) Elementary (K-8), and (3) Secondary (7-12). The use of "secondary" in this designation is an expandable one - programs included here range from one described as middle/high school to remedial mathematics program for learning disabled college students. Programs and materials included in the National Diffusion Network (NDN) are not relisted in our lists though they would qualify based on our criteria. Consult the NDN directory for information on these items.

Identification of promising and exemplary programs and materials is a continuing effort. We invite nominations that include descriptions for the programs and materials and the actual materials. Contact the ERIC/SMEAC for nomination forms and further information.

Selected Promising and Exemplary Materials for Programs K-12

TITLE OF PROGRAM:

Add-Ventures for Girls: Building Math Confidence

SOURCE(S):

Research and Educational Planning Center, Nevada University, Reno, with funding from Women's Educational Equity Act Program (ED), Washington, DC

AUDIENCE:

Elementary and Junior High Teachers

PROGRAM DESCRIPTION:

There are two guides in this program: Elementary and junior high. Each guide is designed to provide teachers with materials they can use with young women to help them achieve in mathematics and to encourage them to take as many math courses as possible in high school. During their early school years, students develop skills and attitudes toward learning that form the basis of future academic growth. Each guide includes strategies, activities and resources that deal with five major topics. Part 1, "Attitudes and Math" includes materials on mathematics confidence, math aspirations and expectations, and attribution patterns. Part 2, "Math Relevance," contains materials related to interest in mathematics, making mathematics more relevant and useful, and positive role models for girls. Part 3, "The Learning Environment," contains materials on teacher-student interaction patterns, cooperative learning, problem solving, and independent thinking, intellectual risk taking and creative problem solving. In Part 4, "Other Issues," there are materials on computers, spatial visualization skills, and test-taking skills, Part 5, "Mathematics Promotion," includes materials on parent involvement, school counselors, and administrators and other research findings on the practices and/or attitudes that affect girls' math attitudes and performance. Strategies, activities, and resources that can be used to address each topic are described. Within each topic, activities for the primary grades are generally listed before those for the intermediate grades. An annotated resource list at the end of each chapter provides resources that contain strategies, activities, and ideas.

PRODUCTION DATE: 1989.

EVALUATION AND/OR COMMENTS:

"Welcome addition to mathematics textbooks. As a supplementary text it far outclasses any previously produced work in this area...The text first educates the teacher on the nature of the problem before giving activities to help solve the problem...Refreshingly gender and culturally unbiased.

I experimented with a number of the activities on my nine-year-old son, and found him begging for more when I stopped. Math had suddenly become a game...a very fun game. What is equally important, especially to a mathematician, is that he could explain the mathematics behind the activities." (J. Keith Brown, North Carolina School of Science and Math)

MATERIALS AVAILABLE:

Elementary Teacher's Guide

Junior High Teacher's Guide

CONTACT:

WEEA Publishing Center
Education Development Center, Inc.
55 Chapel St.
Newton, MA 02160
(617) 969-7100 (inside MA)
1-800-225-3088 (outside MA)

TITLE OF PROGRAM:

EQUALS

SOURCE(S):

Lawrence Hall of Science, Berkeley, CA with funding from state and federal sources.

AUDIENCE:

K-12

PROGRAM DESCRIPTION:

EQUALS is designed to encourage all students, particularly women and minorities, in mathematics classes. There are three major components of EQUALS: staff development, curriculum improvement, and family learning. EQUALS fosters interest and involvement in math by using innovative instructional strategies and challenging curricular activities that promote understanding and improved attitudes. Computer experiences enable students and teachers to make full use of this powerful tool. Materials and staff development opportunities are available for family participation in improving attitudes and increasing awareness of career opportunities. Curriculum materials stress cooperative group work; focus on problem solving approaches to mathematics; promote awareness of equity issues; relate math technology to careers; emphasize use of manipulative materials for all ages; and include activities from all essential concept areas of the mathematics curriculum.

PRODUCTION DATE: 1977.

EVALUATION AND/OR COMMENTS:

Evaluation data indicate EQUALS programs increase student enrollment in advanced mathematics classes; improve student attitudes toward the study of mathematics; increase student interest in math-related occupations. enhance professional growth of teachers; and increase parent involvement in the schools.

MATERIALS AVAILABLE:

SPACES: Solving Problems of Access to Careers in Engineering and Science

Math for Girls and Other Problem Solvers

Use EQUALS to Promote the Participation of Women in Mathematics

Off and Running

I'm Madly in Love with Electricity and Other Comments About Their Work by Women in Science and Engineering

We All Count in FAMILY MATH

FAMILY MATH

CONTACT:

Nancy Kreinberg, Director
EQUALS
Lawrence Hall of Science
University of Califor ia
Berkeley, CA 9472?
(415) 642-1823

TITLE OF PROGRAM:

Family Math

SOURCE(S):

Lawrence Hall of Science, Berkeley, CA with funding from federal and state sources

AUDIENCE:

K-12 (teachers, parents, students)

PROGRAM DESCRIPTION:

Family Math provides parents with mathematical experiences to acquaint them with the changing content and instructional strategies of new math curricula and to offer suggestions for doing math together with their children. A typical Family Math course includes six to eight sessions of one to two hours. Problem solving approaches and understanding concepts and processes are the major goals. Topics include arithmetic, calculators and computers, geometry (spatial visualization), probability and statistics (interpreting data), logic (reasoning mathematically), estimation, and measurement. Participants use manipulatives, hands-on activities, explorations and discovery, communication and discussion, cooperative learning and a variety of problem solving strategies to develop understanding of the mathematical content and approach. The program encourages using people in math-related careers to talk about how math is used and to serve as role models. Participating teachers develop their skills in a two day training session.

PRODUCTION DATE: 1983.

EVALUATION AND/OR COMMENTS:

The effectiveness of the program is indicated by increased achievement in spatial visualization, approximation, data interpretation, and mathematical reasoning, and increased parent involvement in their children's mathematical activities.

MATERIALS AVAILABLE:

Family Math, a book describing the complete course

"We All Count in Family Math," a film

Training Workshops

CONTACT:

Virginia Thompson, Director
FAMILY MATH
Lawrence Hall of Science
University of California
Berkeley, CA 94720
(415) 642-1823

TITLE OF PROGRAM:

Florida Middle Grades Mathematics Instructional Model

SOURCE(S):

Lee County School District of Fort Myers, Florida using ECIA Chapter 2 funds

AUDIENCE:

K-12 teachers

PROGRAM DESCRIPTION:

Florida Middle Grades Mathematics Instructional Model (FMGM) is a research-based instructional model using aspects of Good and Grouw's effective teaching models, Madeline Hunter's Strategies for Master Learning, cooperative learning and computer-managed instruction. The model consists of the following components: progress check, lesson development, monitored practice, lesson wrap-up, weekly review, end-of-unit sequence, activity day and an optional computer-management system. The model provides a basic structure within which individual teaching styles and students' abilities and interest can be accommodated. The overall objective is to teach the existing required district curriculum within the context of the following underlying goals: (1) to enhance achievement of all students; (2) to provide basic structure for instruction while encouraging diversity in individual style; (3) to use every available minute of class time in a productive manner; (4) to integrate research-based instructional strategies; (5) to include the use of technology; (6) to minimize the amount of out-of-class time needed for teacher preparation; (7) to improve cooperation among teachers, parents, and students; and (8) to address the principal's need to monitor students' progress.

PRODUCTION DATE: 1987.

EVALUATION AND/OR COMMENTS:

Over sixty teachers have been trained in FMGM. Most speak favorably of the program. Increased time on task and structured framework are benefits frequently cited by teachers.

MATERIALS AVAILABLE:

Booklet describing components

Description of daily tasks in each component

Teacher self-evaluation checklist

CONTACT:

Sue Fowler, Coordinator
Lee County School Board
2055 Central Ave.
Fort Myers, FL 33901
(813) 481-7476

TITLE OF PROGRAM:

Great Explorations in Math and Science (GEMS)

SOURCE(S):

Lawrence Hall of Science, Berkeley, CA with grants from the Carnegie Corporation of New York and the A. W. Mellon Foundation. Workshops funded by a grant from the National Science Foundation

AUDIENCE:

Preschool to Grade 10. Can be augmented through grade 12.

PROGRAM DESCRIPTION:

GEMS is a series of activities in math and science using inexpensive hands-on materials in the explorations. The activities involve engaging experiments where students observe, record data, make conjectures, and discover relationships and principles. Presentation of GEMS activities does not require special training in math or science. Materials needed are easy to obtain. Opportunities to master key content and process skills are combined with fun activities. Currently there are 20 teacher's guides ranging from 2 to 15 sessions each and from kindergarten to grade 10.

PRODUCTION DATE: 1985.

EVALUATION AND/OR COMMENTS:

Approximately 2000 teachers are currently using the guides. Identified as a Program of Excellence by the Sharing Success in Florida program.

MATERIALS AVAILABLE:

Teachers Guides

Acid Rain (8 sessions, Grades 6-10)—This unit combines scientific inquiry and critical thinking skills as students learn about acids and the pH scale, make "fake lakes" and determine how the pH changes after an acid rainstorm, present a play focusing on the effects of acid rain on aquatic life, and hold a town meeting to discuss possible solutions to the problem of acid rain; they also experiment to determine the effect of various dilutions of acid on seed germination.

Animal Defenses (2 sessions, Grades Preschool-K)—In this activity, the children add defensive structures to an imaginary defenseless animal.

Animals in Action (5 sessions, Grades 6-9)—While observing animals in a large classroom corral, the class experiments by changing the corral environment and adding different stimuli. Then teams of students generate hypotheses, conduct experiments, and hold a scientific convention to discuss their findings.

Bubble-ology (10 sessions, Grades 5-9)—Students devise an ideal bubble-blowing instrument; test dishwashing brands to see which makes the biggest bubbles; determine the amount of glycerin needed for the biggest bubbles; employ the Bernoulli principle to keep bubbles aloft; use color patterns to determine when bubbles will pop; and create bubbles that will last for days.

Buzzing a Hive (10 sessions, Grades Preschool-3)—Students learn about the complex social behavior, communication, and hive environment of the honey bee by making paper bees, a hee hive, flowers with pollen, and bee predators.

Ch·mical Reactions (3 sessions, Grades 6-10)—An ordinary ziplock bag becomes a safe laboratory, as students mix chemicals that bubble, change color, get hot, and produce gas, heat, and an odor. They experiment to determine what causes heat in this chemical reaction.

Color Analyzers (4 sessions, Grades 5-8)—Students investigate light and color while experimenting with diffraction gratings and color filters. They use color filters to decipher secret messages, then create their own secret messages. A class set of red and green filters and diffraction gratings is included.

Convection: A Current Event (4 sessions, Grades 6-9)—Students explore this important physical phenomenon by observing and charting the convection currents in a liquid. They then explore convection in air and generalize their patterns to wind. Convection is also related to other ways that heat moves and to the movement of magma inside the earth.

Crime Lab Chemistry (2 sessions, Grades 4-8)—Challenged to learn which of several black pens was used to write a ransom note, students learn and use the chemical technique of paper chromatography.

Discovering Density (4 sessions, Grades 6-10)—Students attempt to layer various liquids in a straw, leading them to explore the concept of density for themselves. The teacher then introduces the formula for determining density.

Earth, Moon, and Stars (15 sessions, Grades 5-9)—Students investigate ancient models of the world, earth's shape, gravity, the moon and its phases, star clocks, and star maps. The activities about the earth, moon, and stars help students learn about astronomy and include observing and recording changes in the sky and creating models to help explain observations.

Earthworms (3 sessions, Grades 6-10)—Students observe and record the pulse rates of earthworms. They experiment to discover the responses of earthworms to different temperatures, and graph the results.

Experimenting With Model Rockets (7 sessions, Grades 6-10)—The process of controlled experimentation is introduced in this series of rocketry activities. Students experiment to see what factors influence how high a model rocket will fly by varying the number and placement of fins or the length of the body. Safety and teamwork are stressed. Because students use Height-O-Meters to measure rocket altitudes, it is necessary to complete that GEMS unit before doing these rocketry activities.

Fingerprinting (3 sessions, Grades 4-8)—The fingers-on activities in this unit allow students to explore the similarities and variations of fingerprinting. Students take their own fingerprints and apply classification skills to solve a crime.

Global Warming and The Greenhouse Effect (8 sessions, Grades 7-10)—Students explore this controversial topic by building a "greenhouse model" of the atmosphere, playing a "greenhouse simulation game," and comparing the amounts of carbon dioxide in car exhaust, human breath, air, and the gas created by the reaction of baking soda with vinegar.

Height-O-Meters (4 sessions, Grades 5-10)—Students are introduced to the principle of triangulation by making simple cardboard devices called Height-O-Meters. Students measure angles to determine the height of the school

flagpole, and compare how high a styrofoam and rubber ball can be thrown. Going further activities relate triangulation to the real-life activities of forest rangers and astronomers.

Hide a Butterfly (3 sessions, Grades Preschool-3)—The children create a large mural of a meadow in blossom, make paper butterflies and bird puppets to enact "The Butterfly Play," and learn about protective coloration.

Hot Water & Warm Homes From Sunlight (5 sessions, Grades 4-8)—Students build houses and hot water heaters to discover more about solar power. They conduct experiments to determine the effects of size, color, and number of windows on the amount of heat produced from sunlight.

Involving Dissolving (4 sessions, Grades 1-3)—Students learn about the concepts of dissolving, evaporation, and crystallization. Using familiar substances, they create homemade "gel-o," colorful disks, and crystals that emerge on black paper to make a "starry night."

Liquid Explorations (7 sessions, Grades K-3)—In this series of activities, students explore the properties of liquids; they play a classification game, observe how food coloring moves through different liquids, then create secret salad dressing recipes and an "ocean in a bottle."

Mapping Animal Movements (4 sessions, Grades 5-9)—Students apply field biology techniques, using a sampling and mapping system to quantify and compare the movements of hamsters and crickets. Students plan and conduct experiments, graphing changes in movement patterns when food and shelter are added to the environment.

Mapping Fish Habitats (4 sessions, Grades 6-10)—Students learn about and apply the field mapping techniques of aquatic biologists as they chart the movements of fish in a classroom aquarium. Students plan experiments to determine the effects of an environmental change on the home ranges of the fish.

More Than Magnifiers (4 sessions, Grades 6-9)—In a series of four activities, using the same two lenses, students find out how lenses are used in magnifiers, simple cameras, telescopes, and slide projectors. They learn that lenses have certain measurable properties that can help determine which lenses are best for specific purposes. Class sets of lenses are available for purchase from the GEMS project.

Of Cabbages and Chemistry (4 sessions, Grades 4-8)—This series of activities offers students a chance to explore acids and bases using the special indicator properties of red cabbages. Students discover that chemicals can be grouped by behaviors, and relate acids and bases to their own daily experience.

Oobleck: What do Scientists do? (5 sessions, Grades 4-8)—Students investigate and analyze the properties of a strange green substance named "Oobleck," said to come from another planet. The class holds a scientific convention to critically discuss experimental findings and design a space craft to land on an ocean in "Oobleck."

Paper Towel Testing (4 sessions, Grades 5-8)—In a series of experiments, the students rank the wet strength of absorbency of four brands of paper towels. Based on their findings and the cost of each brand, they determine which is the "best buy." These activities provide a stimulating introduction to both consumer science and the concept of controlled experimentation.

River Cutters (3-6 sessions, Grades 6-9)—This unit presents students with a unique way to collapse geological time in a model river system, using diatomaceous earth. Students create rivers, observing and recording their results. They acquire geological terminology and begin to understand rivers as dynamic, ever-changing systems. The concepts of erosion, pollution, and human manipulation of rivers are introduced.

Vitamin C Testing (4 sessions, Grades 4-8)—This activity provides a stimulating introduction to chemistry and nutrition. Students perform a simple chemical test using a vitamin C indicator to compare the vitamin C content of different juices and graph results. Older students can examine the effects of heat and freezing on vitamin C content.

QUADICE (5 sessions, Grades 4-8)—This mathematical game encourages students to perform mental calculations, handle fractions with greater confidence, and explore probability.

GEMS Teacher's Handbook

GEMS Leader's Handbook

Assembly Presenter's Guides

The "Magic" of Electricity
Solids, Liquids, and Gases

Exhibit Guides

Shapes, Loops & Images
The Wizard's Lab

CONTACT:

Jacqueline Barber
Lawrence Hall of Science
University of California
Berkeley, CA 94618
(415) 642-7771

Selected Promising and Exemplary Materials for Programs K-9

TITLE OF PROGRAM:

Activities to Integrate Mathematics and Science (AIMS)

SOURCE(S):

AIMS Education Foundation; Fresno Pacific College. 1982 NSF grant initiated the project. By 1986 the AIMS Education Foundation arose as a separate entity.

AUDIENCE:

Grades K-9

PROGRAM DESCRIPTION:

Project AIMS produces curriculum materials that deal with the integration of learning experiences, problem solving activities, and the use of cooperative learning. Designed to supplement the science-mathematics curriculum, these booklets contain activities that provide students with opportunities to explore natural phenomena and develop both mathematical and science skills.

PRODUCTION DATE: 1986.

EVALUATION AND/OR COMMENTS:

The Summer, 1990 workshops attracted an enrollment of 6,615 teachers, a 65% increase over that of 1989. The one-week workshops were offered at 60 sites in 27 states.

MATERIALS AVAILABLE:

Each booklet consists of activities each of which contain student sheets and a teacher's guide.

Booklets:

Down to Earth: Solutions for Math + Science (Grades 5-8) contains 15 investigations of such earth science topics as geology, oceanography, and meteorology.

Fall Into Math and Science (Grades K-1) contains 15 investigations on such topics as weather, food, human growth, plant life, fall holidays, and leaves.

Finding Your Bearings (Grades 4-9) contains activities that integrate geography, mathematics, and science.

Floaters and Sinkers: Solutions for Math and Science (Grades 5-8) includes 26 investigations that demonstrate the concept of density.

From Head to Toe (Grades 5-9) includes studies of the human body, its framework, respiratory system, and circulatory system. The activities focus on measurement and provide an excellent vehicle to build self awareness and establish a basis for a good physical fitness program.

Fun With Foods (Grades 5-8) contains 25 investigations that use food and equipment found in kitchens, supermarkets, or school classrooms to teach and reinforce process skills in math and science.

Glide Into Winter With Math and Science (Grades K-1) contains 16 investigations that employ graphing skills, as children observe, interpret, and record data provided by the happenings of the winter season. Topics include weather, static electricity, growing crystals, nutrition, and the human body.

Hard Hatting in a Geo-World (Grades 3-4) includes 25 investigations relating to geometry, structure, and measurement.

Jawbreakers and Heart Thumpers (Grades 3-4) combines the study of fun foods and body basics.

Math + Science-A Solution (Grades 5-8) presents 25 introductory investigations, sequenced from the simple to the complex according to these science processes: observing and classifying, measuring, estimating, predicting and hypothesizing, controlling variables, gathering and recording data, and applying and generalizing.

Mostly Magnets (Grades 2-8) includes activities in which students learn about the varied behavior of magnets and clarify the attendant concepts.

Our Wonderful World: Solutions for Math + Science (Grades 5-8) contains 19 sequenced investigations in environmental studies covering the following topics: air, water, water transport, soil, plants, animals, and insects.

Out of This World, Book A (Grades 5-9) is the first of two books dealing with the solar system and astronomy. Book A concentrates on studies involving the planets and moon.

Overhead and Underfoot (Grades 3,4) includes 15 investigations related to the natural environment. Topics covered include the weather, plants, soil, geology, and conservation.

Pieces and Patterns: A Patchwork in Math and Science (Grades 5-9) includes 19 sequenced investigations on such topics as probability and statistics, turtle graphics, and geometry.

Primarily Bears Book (Grades K-3) contains 16 investigations that include problems in logic, permutations and arrangements, probability and statistics, and measurement and graphing.

Primarily Plants (Grades K-3) contains 22 investigations that cover such concepts as: most plants grow in soil, all plants need water and are affected by temperature, green plants need light, flowers produce seeds that grow into new plants, ferns and mosses are simple green plants, and many kinds of plants have roots, stems, leaves, and flowers.

Primarily Physics (Grades K-3) consists of 32 activities investigating sound, light, and heat energy.

Popping With Power (Grades 3-4) contains activities that deal with energy sources and conservation. Students become machinists, engineers, and electricians as they answer questions related to energy.

Seasoning Math and Science: Spring and Summer (Grade 2) includes 22 investigations related to three main units: Life Sciences, Earth-Space Sciences, and Physical Sciences.

Seasoning Math and Science: Fall and Winter (Grade 2) includes 22 investigations on topics such as holidays, plants, color, weather, and light.

The Sky's the Limit! With Math and Science (Grades 4-8) contains 24 investigations related to the science of aerodynamics.

Soap Films and Bubbles (Grades 4-9) contains activities which allow extensive exploration into the behavior of soap films.

Spring Into Math and Science (Grades K-1) includes 15 investigations on water, solar energy, rainbows, holiday cooking, and chemical reactions.

Water Precious Water (Grades 2-6) contains investigations that relate to water awareness, general process skills, water cycle, evaporation, conservation, treatment, quality absorption and erosion, distribution, and water properties.

Each of the investigations contains a specific lesson plan—including time and materials needed, background information, procedures, discussion questions, and extension. Several reproducible student pages are provided with each investigation. Other booklets are also available.

CONTACT:

AIMS Education Foundation
P.O. Box 8120
Fresno, CA 93747
(209) 255-4094

TITLE OF PROGRAM:

Figure Out

SOURCE(S):

Produced by the Mississippi Authority for Educational Television in association with AIT.

AUDIENCE:

Grades 5 and 6

PROGRAM DESCRIPTION:

Figure Out is a series of audiovisual programs which use whimsical dramas to provide remedies for typical trouble spots in learning mathematics. The computer whiz Alice rescues the intelligent computer Mac. Their adventures involve competition with Sidney Slinker who created Mac and with Rae the friendly owner of a local computer shop.

PRODUCTION DATE: 1982.

EVALUATION AND/OR COMMENTS:

Silver Award, Houston Film Festival for program 5, 1982. Broadcast Media Award, San Francisco State University for program 5, 1982.

MATERIALS AVAILABLE:

Guides

Audiovisual Cassettes

Mac Remembers Place Value (Place Value)—Alice's race to restore her computer friend's memory introduces the significance of place value and the meaning of a digit's location in a number.

Alice Reads Numbers While Mac Mopes (Reading Numerals)—Rivalry between Mac and a new computer leads to a discussion of how to separate digits into periods and how to read large numbers.

A Rainy Night, a Sick Computer, an Estimate (Estimating to Tens and Hundreds)—Alice estimates prices to see if she has enough money for spare parts.

Singing to Millions, Rounding to Thousands (Estimating to Thousands)—Alice estimates the revenues Mac will earn on a new recording contract.

Omnivac's Troubles Add Up (Addition of Hundreds)—Attempts by Mac and Alice to repair the world computer trigger an explanation of addition with and without regrouping of digits.

Fame, Heat, Subtraction (Subtraction of Hundreds, No Regrouping)—Finding the difference between two three-digit numerals is illustrated as Alice tries to make a television commercial and Mac deals with a repairman.

Mac Subtracts in Jail (Subtraction of Hundreds, Single Regrouping)—Mac's undercover venture to capture a computer embezzler demonstrates subtraction with only one regrouping.

Andrew Subtracts to Find Romance (Subtraction of Hundreds, Zeros in the Minuend)—Romance spurs Mac's friend Andrew to find the answer to a subtraction problem in which the minuend is a multiple of 100.

Exploration, Aggravation, Multiplication (Multiplication, One Digit Times Two Digits/Three Digits)—Multiplication by a one-digit factor is defined in the context of a struggle to free Alice from a cave-in.

Not with a Bang but with Multiplication (Multiplication, Two Digits Times Two Digits)—Mac is saved from a kidnaping by Alice's ability to estimate and find the answer to multiplication problems in which regrouping is required.

Mac's Fame is Multiplied (Multiplication, Two Digits Times Three Digits)—Mac's campaign for mayor introduces the hand-held calculator and explains how to estimate the answer before using a calculator.

Happy Division to Mac (Division, Two Digit Dividend, One Digit Divisor)—A surprise birthday party gives Mac's friends a chance to divide.

Divided It Falls (Division, Three Digit Dividend, One Digit Divisor)—Efforts to capture an escaped gorilla lead to the need to solve division problems, including one in which the answer contains a middle zero.

Straining, Stretching, Dividing (Division, Three Digit Dividend, Two Digit Divisor)—Alice's desire to lose weight creates situations in which she divides by a two-digit divisor and explains the sequence necessary to find a quotient when using a calculator.

Divide and Conquer (Multi-step Problems)—As Mac becomes a super-computer, multi-step, multi-operation verbal problems are solved with a calculator.

CONTACT:

AIT Instructional Services
Box A
Bloomington, IN 47402
1-800-457-4509

TITLE OF PROGRAM:

Integrating Science, Math, and Technology (K-6)
(I. Science MaTe Curriculum)

SOURCE(S):

Math/Science Nucleus
Fremont, CA

AUDIENCE:

K-6

PROGRAM DESCRIPTION:

Integrating Science, Math and Technology is an interdisciplinary program which emphasizes critical thinking and hands-on activities. The themes: Applied Sciences, Universe Cycle, Plate Tectonic Cycle, Rock Cycle, Water Cycle, Life Cycle are spiraled and balanced throughout grades K to 6. The scope and sequence details a 34 week program per grade level. Each teacher manual has content information, student lab sheets, and pre-, during, and post activities. Although most of the themes in this program are focused on science topics for the six units contained in the K-6 program, one theme (*Applied Sciences*) contains a three-week unit which emphasizes the integration of science and mathematics with appropriate subtopics for each grade level.

PRODUCTION DATE: 1986.

EVALUATION AND/OR COMMENTS:

The following persons have implemented the I.Science MaTe curriculum and have received awards for their outstanding efforts toward bettering the quality of science education: Susan Dutcher, McNair Elementary School, Ravenswood City School District, East Palo Alto, CA: Santa Clara County, Kent Award for Exemplary Elementary Program (1988); Arlene Hudson, Menlo Oaks Intermediate School, Ravenswood City School District, East Palo Alto, CA: Santa Clara County, Kent Award for Exemplary Middle School Program (1989); Joyce Blueford, Math/Science Nucleus, Fremont Schools Management Association, Outstanding Friends of Education, 1985, in recognition for Elementary School Science Program at Blacow Elementary, Fremont, CA; Joyce Blueford, U.S. Geological Survey, Federal Employee of the Year Award (Equal Opportunity) 1984 for elementary science program in low-income schools in California; Math/Science Nucleus, Recognition Award, Fremont (CA) Unified (1983-1990) for work done in assisting school district on District School Program.

MATERIALS AVAILABLE:

Teacher manuals and student labo tory guide manuals are available for each of the six units. The total curriculum set includes more than 1500 pages and 700-plus activities. Teachers may duplicate materials for students.

Units

Applied Sciences - Our Technological World (8 weeks, 168 lesson plans)—Themes covered include *Science and Math, Physics, Technology, and Built Environment. Applied Sciences* is all sciences "rolled' into some product or principle that we use everyday in our lives. Students learn by hands-on activities what science is and how math is very important in any study of science. They learn how the principles of physics are so basic to the technology that we use everyday. Students are also

introduced to the effects of technology on our planet. Topics within the third unit that is focused on the integration of science and mathematics are as follows:

Kindergarten	Tools of discovery senses
Grade one	Describing discoveries, senses
Grade two	Estimating/predicting, symmetry
Grade three	Linear, volume, experiments
Grade four	Plotting data, perception
Grade five	Interpreting data, graphing
Grade six	Scientific method, experiments

Universe Cycle - The Search for Our Beginning (4 weeks, 84 lesson plans)—Themes covered include *Universe, Solar System, Earth, and Geography.* Hands-on activities teach students about facts and fantasies of the universe. Take a closer look at the Earth and its relationship within our solar system. Geographic locations that are used in labs throughout the year are also explored.

Plate Tectonic Cycle - Earth's Moving Force (4 weeks, 84 lesson plans)—Themes covered include *Volcanoes, Earthquakes, Plate Tectonics, and Hazards.* Hands-on activities teach students how scientists investigate the Earth through earthquakes and volcanoes and how to challenge and think about present theories. Learning how to cope with disaster caused by plate tectonics is also emphasized.

Rock Cycle - Understanding The Earth's Crust (6 weeks, 126 lesson plans)—Themes covered include *Chemistry, Minerals, Rocks, and Past Life.* Within the rock cycle, chemistry comes alive as students are taught about the periodic chart and how elements combine to form minerals. Throughout this cycle we emphasize the importance plate tectonics. The remains of past life or fossils preserved in sedimentary rock are used to show how the "present is the key to the past" and why evolution is important in timing of events on Earth.

Water Cycle - The Earth's Gift (4 weeks, 84 lessons plans)—Themes covered include *Water, Oceans, Atmosphere, and Weather.* Students discover the properties of water that make it the perfect liquid for life. We learn about the molecular structure of water and the uniqueness of water, concluding surface tension, capillary action, density, and other physical properties. Students also learn about how the oceans, atmosphere, and weather are all interrelated.

Life Cycle - Diversity in A Balance (8 weeks, 168 lessons)—Themes covered include *Organisms, Human Biology, Plant Life, and Natural Environment.* Students learn about themselves and their environment. They study tissues, organs and body functions, diseases, and genetics. Hands-on activities including looking at various organisms by determining the different groups of vertebrates and invertebrates. Students learn about plant parts, photosynthesis, the carbon cycle, and why plants are important. The food chain and how it is involved in the natural environment gives students a perspective on how we all interrelate on this planet.

CONTACT:

Joyce Blueford
Math/Science Nucleus
3710 Yale Way
Fremont, CA 94538
(415) 490-6284

TITLE OF PROGRAM:

It Figures

SOURCE(S):

Produced for AIT by Glenhill Production, Ltd., Kettleby, Ontario; Illinois State Board of Education; KLCS, Los Angeles; KOCE, Huntington Beach, CA; Larry Wood Productions and KLVX, Las Vegas; Maryland Instructional Television; New Jersey Network; and South Carolina Educational Television Network. The computer component was developed by Massachusetts Educational Television, Massachusetts Department of Education, and AIT

AUDIENCE:

Grade 4

PROGRAM DESCRIPTION:

It Figures is a series of audiovisual programs using problem solving situations real to young children to strengthen skills, concepts, and problem solving strategies. Each program has real life situations and an animated portion which reinforces the mathematical concept of the program. Each program strengthens a specific skill, idea, or problem solving strategy. Young students are seen discussing and using mathematics to solve problems. Programs may be used together or singly.

PRODUCTION DATE: 1986.

EVALUATION AND/OR COMMENTS:

In a study of teachers using *It Figures* almost all that, indicated definitely or probably, the programs increased quality of instruction, improved students' attitudes and understanding of processes and ideas, and helped make math relevant to life. The teachers were less sure about its effect on problem solving.

MATERIALS AVAILABLE:

Video Kit
Video guides
Computer component
Computer guide

Videocassettes

Deciding When to Use Subtraction
Deciding How Close to Measure
Problem Solving: Acting Out
Using Estimation

Understanding Place Value
Deciding When to Use Multiplication
Using Fractions
Problem Solving: Drawing a Picture
Looking at Objects from Different Positions
Using Mental Computation
Using Division
Problem Solving: Making a Table

Using Bar Graphs
Bar Graphs
Understanding Remainders
Problem Solving: Recognizing Necessary Information
Finding Equivalent Fractions
Finding Area by Covering
Making Sense of a Big Number
Estimating When Dividing
Comparing Decimals

Using Probability
Changing Scale on a Graph
Problem Solving: Keep on Trying

Using Multiplication and Addition
Relating Fractions and Decimals
Predicting Your Change
Problem Solving: Many Ways to Go
Problem Solving: Using a Guide

CONTACT:

AIT Instructional Services
Box A
Bloomington, IN 47402
1-800-457-4509

TITLE OF PROGRAM:

Instructional System in Mathematics (ISM)

SOURCE(S):

Montgomery County Public Schools, Rockville, MD

AUDIENCE:

K-8

PROGRAM DESCRIPTION:

Instructional System in Mathematics (ISM) is an objectives based, computer supported, management system which builds upon a previously developed mathematics curriculum. The system is made up of: an instructional component, an assessment component, and a computer reporting component. ISM provides teachers with: a consistent description of learning outcomes; tests to provide approximate starting points; resources to support the individual instructional planning of teachers; consistent assessment recommendations for judging student progress; reports to show student achievement in various formats for communication and planning purposes.

PRODUCTION DATE: 1990.

EVALUATION AND/OR COMMENTS:

Evaluation data were gathered in 1977-78, the first full year of operation of ISM. Thirty-four schools were involved. Data were gathered via structured in-class observations and questionnaires for teachers, principals, aides, and students. Data indicated that after the introduction of ISM, teachers spent more time in instructional planning, especially for individuals and small groups of students. Examination of classroom practices resulted in the finding that this planning did result in many instances of instruction which appeared to match individual student needs although this was not universally true throughout the sample. The influence of ISM was more apparent in elementary grades than at the junior high school level. Teachers and administrators liked ISM and perceived it as beneficial. Achievement test findings provided limited, but real evidence that ISM, once established, could aid mathematics achievement.

MATERIALS AVAILABLE:

Components of the System:
- The Program Studies
- The Instructional Guide
- Placement Tests
- Assessments
- Computer Reports

CONTACT:

Tom Rowan
Montgomery County Public Schools
850 Hungerford Drive, Room 269
Rockville, MD 20850
(301) 279-3000

TITLE OF PROGRAM:

Jostens Learning Mathematics Curriculum

SOURCE(S):

Jostens Learning Corporation

AUDIENCE:

Grades 1-8

PROGRAM DESCRIPTION:

The Jostens Learning Mathematics Curriculum is a computer-assisted instruction package to complement basic instruction. The goal of instruction is to produce students who are thinkers who have the ability to organize, integrate, and express ideas. The materials assume that cognitive development proceeds from concrete to iconic to abstract. To facilitate learning, flexible thinking, and retention, students experience multiple embodiments of concepts, skills, and strategies. To assure a high success rate the materials are carefully sequenced. At levels 1-6 there are 700 fifteen-minute lessons covering basic knowledge in numeration and geometry, operation skills, and applications using measurement, estimation, mental computation, data analysis, and problem solving. At levels 7-8 there are 80 forty-five minute lessons covering number, algebra, geometry and measurement, graphing, statistics, and probability. Instruction is individualized by a variety of on-line interactive capabilities: branching within and between lessons, on-line tutorials, hypertext functions, on-line notebook and calculator, voiced, and on-screen positive feedback. A management system and support materials are available as well as correlations with basal textbooks, standardized tests, state, district, and local objectives.

PRODUCTION DATE: 1987.

EVALUATION AND/OR COMMENTS:

The Mathematics Curriculum builds students' math skills in small segments. At levels 1-8, students hone their skills in more than 700 15-minute lessons, which cover three broad areas in eight strands. The Jostens Learning Mathematics Curriculum addresses these priorities by providing a curriculum focused on problem solving, without neglecting essential skills. In addition, material is presented in a motivating format using computer technology to its full advantage. The *NCTM Standards* do more than recommend needed content; they focus on methods of instruction and instructional activities that will foster mathematical learning. The Jostens Learning Mathematics Curriculum emphasizes these methods. For example, lessons introduce new mathematical content through problem situations, involve students actively in their own learning, use calculators throughout the curriculum, and help students recognize that mathematics is an integral part of functioning successfully in the real world.

MATERIALS AVAILABLE:

Grades 1-6 Curriculum:

Numeration—The concept of number establishes readiness for nearly all aspects of the mathematics curriculum. Each unit in numeration elevates the student's awareness of numbers by using strategies and activities that build place-value understanding, work to compare and order numbers, and teach students to round and rename numbers. Instruction in whole numbers, fractions, and decimals are integrated into the numeration strand.

Geometry—Geometry addresses the non-number knowledge base, which includes spatial relationships, classifying, pattern development, plane figures, solids, and coordinate mapping.

Addition and Subtraction—Addition and subtraction are taught concurrently as inverse operations, with addition beginning in each new unit and level of difficulty.

Multiplication and Division—Multiplication and division are also taught as inverse operations. Numerous models establish an understanding of the actions involved. These actions lead to a foundation on which to build algorithmic skills

Measurement—The measurement strand begins with an emphasis on making comparisons -- height, length, weight, area, capacity, money, time, and temperature. An emphasis is placed on measuring with nonstandard units and measuring with standard units -- both metric and U.S. customary.

Estimation and Mental Computation—Estimation and mental computation carry heavy significance for the computation operations. Jostens Learning Corporation incorporates a broad perception of estimation that includes number sense and measurement, as well as computational estimation and reasonableness. Estimation activities incorporate strategies such as front-end estimation, compatible numbers, and rounding. Mental computation promotes numerical facility, mastery of facts and a firm understanding of place value.

Generating and Interpreting Data—Concept and skill development with charts, tables, several types of graphs, probability, and some beginning statistics are all included in order to enable students to function in an information-oriented society.

Problem Solving—Problem solving is far more than solving word problems. Jostens Learning provides analytic experiences for students by having them identify the question, cite the important information, choose the action or operation needed, or find the missing or irrelevant information.

The problem solving strategies taught include Guess& Test, Make a List, Draw a Picture, Find a Pattern, Work Backwards, and Use Simpler Numbers. As students master the individual strategies, they make judgments about which strategies to apply to solve both routine and nonroutine problems.

Grades 7-8 Curriculum:

Number Strand—explore number theory (primes, composites, and divisibility rules), integers, rational numbers, and number patterns. This unit provides an opportunity for students to gain a deeper understanding of the various forms in which rational numbers can be expressed, such as percentage, fraction, decimal, ratio, and negative exponents. In addition to revisiting elementary topics from a conceptual point, this unit develops traditional middle school topics such as integers, as well as introduces many topics, such as Pascal's Triangle, Fibonacci numbers, and scientific notation.

Algebra Strand—provides middle-level students with important pre-algebra and beginning algebra experiences. Algebra is introduced in a historical setting as a way to describe relationships between several variables. Some other topics in the strand include: evaluating monomials and binomials, translating words into symbols, generalizing patterns, solving linear equations, graphing linear functions and inequalities, solving simultaneous equations, absolute value, and an intuitive introduction to quadratic functions. In addition, the function concept of a variable pervades the strand. Function machines are used to help students evaluate expressions, solve equations, identify inverse operations, and

simplify expressions. Another example of conceptual understanding occurs when students use a pan balance to solve equations.

Geometry/Measurement—introduces students to the more nontraditional areas of transformational geometry and spatial visualization, as well as the traditional topics of area, volume, perimeter, and surface area. Specific topics include: symmetry, transformations, tessellations, polygons, polyhedra, similarity, and congruence. The emphasis is on understanding formulas and recognizing when to apply them—rather than merely computing with them.

Graphing/Statistics/Probability—in this strand students develop a conceptual understanding of descriptive statistics and probability. By manipulating graphics on the screen, students gain an intuitive feel for mean, median, and mode. Students also learn to construct, read, and interpret bar graphs, line graphs, circle graphs, and scatter diagrams. Other methods used to describe data include percentiles, lines of best fit, and recognition of shapes of distributions. Concepts of probability are developed through lessons on counting techniques, tree diagrams, and probability using cubes. Finally, students explore experimental probability, including concepts of sampling, variability of experimental results and simulation as a way to estimate probabilities which are difficult to calculate theoretically.

Basic Skills Inventory:
- An on-line criterion-referenced test
- Teacher Management System
- Alternative Learning Pathways
- Curriculum Guides
- Teacher Guides

CONTACT:

Jostens Learning Corporation
6179 Cornerstone Court East
San Diego, CA 92121-3710
(619) 587-0087

TITLE OF PROGRAM:

LINK: A Middle School Math/Science Program for Excellence

SOURCE(S):

Dougherty County Schools, Albany, GA

AUDIENCE:

Grades 6-8

PROGRAM DESCRIPTION:

Link is a middle school program designed with the emphasis on a process approach to teaching math and science. The major goal of Link is to provide support and training for teachers in the integration of process skills and logical thinking skills in "hands-on," investigative activities to bring about positive changes in the academic performance and attitudes of their students. Link addresses the needs of the middle school child by providing a program which uses concrete manipulatives to enable the student to comprehend abstract science and math concepts. As the student is given opportunities for direct, learning experiences through which he becomes the scientist or the mathematician, he develops skills for problem solving in his daily life. The core components of Link are the process skills and logical thinking skills. Science and math lessons are planned so that these skills become the vehicle for teaching facts and concepts as well as training students in transferable life skills. The active involvement of the student is a key factor in the acquisition and internalization of knowledge and skills. Teachers are trained to use Link in their classes through a strong staff development program designed to effect a change in teaching strategies. The training component enables teachers to provide manipulative activities which students use when learning new concepts or reviewing concepts not previously mastered.

PRODUCTION DATE: 1985.

EVALUATION AND/OR COMMENTS:

Link has been evaluated, using a quasi-experimental design with pre- and post-testing. The evaluation design investigated students' math scores, science scores, classroom activities, student performance on the Group Analysis of Logical Thinking (GALT) test and Middle School Integrated Process Test, student feedback via interviews using the Logical Thinking Performance Interview and the Process Skills Performance Interview, an attitude measure, and additional instruments related to math and science. Evaluators found a significant improvement in students' logical reasoning skills and process skills. Students responded positively to their active involvement in the program.

The Link program was validated by the Georgia State Department of Education in 1988. It has been featured in a publication entitled "Sharing Mathematics Programs Across the Southeast," and it has been recognized by the COSMOS Corporation as an exemplary program.

MATERIALS AVAILABLE:

Manuals have been developed to be used in the applied classes which are a key element in the Link program. The following manuals are available to adopting systems:

Applied Math
Applied Science
Problem Solving
Process Learning/Research

CONTACT:

Virginia Monroe
Dougherty County Schools
P. O. Box 1470
Albany, Georgia 31703
(912) 431-1317
or
Dan Stokes
(912) 431-1315

TITLE OF PROGRAM:

Math Their Way® (Is a Registered Trademark of the Center for Innovation in Education.)

SOURCE(S):

This program was developed independently by Mary Baratta-Lorton based on her experience as a teacher in K-2.

AUDIENCE:

K-2

PROGRAM DESCRIPTION:

This program was developed by Mary Baratta-Lorton for use with elementary school children. It is an activity oriented, child centered program designed to help children develop an insight and understanding of the patterns of mathematics through the use of concrete materials. The program format begins with concrete activity and proceeds to representation of and symbolization of the concept. Chapters include: free exploration, patterns, sorting and classifying, counting, comparing, graphing, number concept, number (connecting level), number (symbolic level), and place value.

PRODUCTION DATE: 1978.

EVALUATION AND/OR COMMENTS:

More than 200,000 elementary school teachers are using the methodology in all 50 states of the Union, reaching approximately 6,000,000 children each year.

MATERIALS AVAILABLE:

The Center for Innovation in Education, a nonprofit institution, markets a full line of manipulative materials, offered in its annual catalog. There are no text books or work books involved in the program. The book "Math Their Way", marketed by Addison-Wesley is a teacher's manual and curriculum for the program.

CONTACT:

Inservice Director
Susan Iwamoto
Center for Innovation in Education
1504 Ell Avenue
Campbell, CA 95008

Program Information:
Paul Lorton
Student Liaison Officer
20665 Fourth Street
Saratoga, CA 95070
(408) 867-5857

TITLE OF PROGRAM:

Math Works

SOURCE(S):

Developed through the resources of a consortium of state and provincial education agencies, managed by AIT, with support of Exxon Education Foundation .

AUDIENCE:

Grade 5

PROGRAM DESCRIPTION:

Math Works is a part of the Mathematics for the 80's project which emphasizes understanding mathematical ideas and being able to solve problems systematically. The programs show students using skills in estimation, mental computation, and problem solving strategies to solve real life problems. Animation is used to highlight selected topics. Documentary illustrations show people using math in real situations.

PRODUCTION DATE: 1985.

EVALUATION AND/OR COMMENTS:

Winner, ACT/Post-Newsweek STOP, LOOK, & LISTEN Award, 1986; Pacific Bell Award for Best in Mathematics, National Educational Film Festival, 1986; CINE Golden Eagle, 1986 for program 21. Formative evaluation data, based on a sample of 107 boys and 83 girls from eight schools for program 25 (Dividing Regions into Subregions for Finding Area) and from 400 children in 10 schools for program 9 (The Difference Between Perimeter and Area), are available as Research Report 94 from the Agency for Instructional Technology and also in ERIC as ED 268 997.

MATERIALS

Guides

Teacher's Guide

Videocassettes

Measurement: Finding Area of Rectangles—Covering a rectangular area with square units, counting the units, and multiplying the number of squares along the length and width reinforce the meaning behind the formula for finding area.

Problem Solving: Identifying the Problem—This program models restating the problem, changing the context, discarding unnecessary information, and indicating what is given and what is needed.

Mental Computation: Using Mental Computation for Addition—Students use the left-right method and the plus-minus method of adding two-digit numbers for specific situations.

Decimals: Place Value in Decimals—The emphasis is on the relative size of numbers to the left and right of the decimal point, including tenths, hundredths, and thousandths.

Geometry: Exploring Geometric Shapes—Ordinary three-dimensional objects are analyzed to identify their two-dimensional components.

Estimating: Estimating by Rounding—Emphasizing the usefulness of rounding in estimation, this program looks at when and how to round up or down.

Problem Solving: Simplifying the Problem—Students develop a parallel problem by decreasing the size of numbers or the number of variables, or by taking one step at a time.

Decimals: Relating Fractions and Decimals—The idea that a decimal is a fraction whose denominator is a power of ten is extended to make the point that only such fractions can be written as terminating decimals. The program models using decimals instead of fractions when they are more appropriate.

Measurement: The Difference between Perimeter and Area—Major points of this program are that perimeter measures boundary in linear units, that area measures the region inside the boundary in square units, and that the same perimeter can surround very different areas.

Problem Solving: Using Tables—With different kinds of tables, the program reviews what a table contains and models both how to read a table to find needed information and how to make a table.

Fractions: Adding and Subtracting Fractions and Mixed Numbers with Like Denominators—The concept behind fractions precedes illustrations of adding and subtracting two fractions and two mixed numbers.

Statistics: Sampling—Students decide when to query an entire population, when to sample, and what to consider when selecting a sample.

Geometry: Exploring the Movement of Objects in Space—Beginning with apparent changes in the shape of a three-dimensional object as it turns, flips, and slides in space, this program helps viewers predict specified movements of an object in space.

Problem Solving: Looking for a Pattern—Geometrical and numerical patterns reinforce the idea of a pattern, finding a pattern helps solve a problem, and viewers are encouraged to find a pattern by looking at data from different perspectives.

Decimals: Comparing Decimals—After reviewing place value, the program moves on to compare the size of two decimals and to order several from smallest to largest.

Problem Solving: Using Diagrams and Models—Flow charts, models, assembly plans, and blueprints simplify, clarify, abstract, or make concrete.

Mental Computation: Using Mental Computation for Subtraction—The left-right strategy introduced for mental addition is applied to subtraction.

Place Value: Place Value of Large Numbers—Special visuals help give viewers a sense of numbers up to and including one million.

Estimating: Other Estimation Strategies—Rounding and front-end truncation vary in their usefulness, depending on the problem. The program emphasizes the reasoning process that underlies choosing a strategy to fit the need.

Fractions: Adding and Subtracting Fractions and Mixed Numbers with Unlike Denominators—This program emphasizes the idea of equivalent fractions in showing how to change unlike fractions and mixed numbers to fractions that can be added or subtracted.

Statistics: Collecting Data—How data can help people make decisions and why it is important to think carefully about how to collect them are emphasized. The program considers determining what data are needed and deciding about the sample, the method of collecting data, and the delineation and allocation of tasks.

Problem Solving: Using Graphs—How to choose the right kind of graph to convey a particular point is the focus of this program, which compares situations in which the different characteristics of bar, circle, or line graphs are most appropriate.

Probability: Possible Outcomes—The first step in calculating the probability of a specific event's occurring is to figure out how many possible outcomes a given situation may have. The program looks at the relationship between possible outcome and probability in examples that include both one out of five and two out of five.

Decimals: Understanding the Placement of the Decimal Point—After reviewing the need to align decimal points in addition or subtraction, the program focuses on knowing where to put them in the answer to a multiplication problem.

Measurement: Dividing Regions into Subregions for Finding Area--This program helps students recognize ways of dividing an irregular region and working with the areas of its subregions to determine its total area.

Statistics: Analyzing Data—In addition to showing children analyzing their own data, this program emphasizes the importance of asking questions to help determine the validity of statistical information--questions about the source of the information, about the size of the sample, and about how accurately the data are portrayed.

Ratio: Forming Ratios—This program demonstrates what a ratio is, how to express ratio in particular examples, when ratio might be used, and what specific ratios mean in specific situations.

Problem Solving: Using Maps—This program focuses on reading and interpreting a map that someone else has prepared. After noting such points as the region covered, the directions, the coordinates, the scale, and the key to symbols, students use maps to find a particular location, to determine the distance between two points, and to plan a route.

CONTACT:

AIT Distribution
Box A
Bloomington, IN 47402
1-800-457-4509

TITLE OF PROGRAM:

Project SEED

SOURCE(S):

Developed with funding by federal, state, local, and private sources in Berkeley, Oakland, Richmond, CA; Dallas, TX; Detroit, MI; and Philadelphia, PA.

AUDIENCE:

Grades 2-8

PROGRAM DESCRIPTION:

Project SEED's goal is to increase the number of minority and educationally disadvantaged students who are prepared for success in high school and college mathematic. and for entry into careers in mathematics and mathematics dependent fields. Scientists and mathematicians from universities, research corporations, and the community teach daily classes in abstract, conceptually oriented mathematics (topics from high school and college level algebra) to supplement regular classroom instruction. SEED instructors use a Socratic, group discovery format. Students discover mathematical principles through answering a sequence of questions posed by the instructor. Instructors use a variety of feedback and involvement techniques to improve students' self-esteem, reinforce and improve their computational and critical thinking skills and prepare them for success in college preparatory mathematics courses. The regular classroom teacher is present when the SEED instructor is working with the class, enabling him or her to learn additional effective teacher strategies.

PRODUCTION DATE: 1963.

EVALUATION AND/OR COMMENTS:

Student outcomes include improved mathematics achievement test scores, increased enrollment in advanced mathematics courses, and decreased grade retentio' . Study: 'The Longitudinal Effects of SEED Instruction on Mathematics Achievement and Attitudes," William J. Webster and Russell A. Chadbourn; Department of Research, Evaluation and Information Systems; Dallas Independent School District; November 1989.

MATERIALS AVAILABLE:

Brochure, evaluation summary, articles.

CONTACT:

Helen Smiler, National Projects Director
Project SEED
2530 San Pablo Ave., #K
Berkeley, CA 94702-2013
(415) 644-3422

Hamid Ebrahimi, National Director
Project SEED
3453 Flair Drive, Suite 123
Dallas, TX 75229
(214) 358-2345

TITLE OF PROGRAM:

Solve It

SOURCE(S):

AIT with financial assistance from the National Science Foundation

AUDIENCE:

Grade 6

PROGRAM DESCRIPTION:

In *Solve It* problem solving and computational skills are developed in real problem situations for children. These audiovisual programs emphasize that knowing how to approach a problem is as important as finding an answer. To understand computation involves more than manipulating numbers. Understanding includes being able to estimate, draw inferences, predict consequences, and recognize unreasonable answers.

PRODUCTION DATE: 1987.

EVALUATION AND/OR COMMENTS:

Winner, Top 100 Products Award of Merit, *Curriculum Product News*, 1987-1988.

Awards Portfolio, *Media and Methods*, 1988.

Golden Babe Award, Chicagoland Educational Film Festival for program 3, 1988.

An evaluation of "Geometry and Measurement: Measuring Volume" and "Problem Solving: Drawing and Interpreting Tables and Diagrams" was conducted to determine effectiveness and appeal. "Measuring Volume" was found effective and enjoyable. Teachers found "Drawing and Interpreting Tables and Diagrams' too technical to grasp in such a short time.

Formative evaluation of individual programs from *Solve It* began August, 1986. A document published in March, 1987, reports that consortium representatives, contest experts, and teachers evaluated scripts for 17 of the 18 programs.

MATERIALS AVAILABLE:

Teacher's Guide

Videocassettes:

Estimation: Reasonableness of Answers
Mental Computation: Using Mental Computation for Multiplication
Ratio/Proportion/Percent: The Meaning of Percent
Problem Solving: Drawing and Interpreting Tables and Diagrams
Measurement: Precision and Estimation
Statistics: Understanding Mean, Median, Mode
Fractions: Multiplication with Fractions and Mixed Numbers
Decimals: Ordering Decimals
Geometry and Measurement: Measuring Volume
Estimation: Estimation Strategies for Multiplication
Problem Solving: Solving a Simpler Problem
Statistics: Sampling
Fractions: Subtracting Mixed Numbers

Estimation: Estimation Strategies for Division
Problem Solving: Guess - Check - Revise
Geometry and Measurement Measuring Angles
Problem Solving: Using Logical Reasoning
Ratio/Proportion/Percent: Scale Drawing and Models

CONTACT:

AIT Instructional Services
Box A
Bloomington, IN 47402
1-800-457-4509

TITLE OF PROGRAM:

TERC Used Numbers Project: Collecting and Analyzing Real Data

SOURCE(S):

Developed by Technical Education Research Center in collaboration with Lesley College with funding by the National Science Foundation.

AUDIENCE:

K-6

PROGRAM DESCRIPTION:

Used Numbers Project materials focus on data analysis—collecting, organizing, and interpreting quantitative data. Problems use real data, require decision making, provide information which can be used or is of high interest, involve multiple representations of the data, encourage discussion and disagreement, lead to further questions, and require a range of appropriate technologies.

PRODUCTION DATE: 1989.

EVALUATION AND/OR COMMENTS:

Pilot testing of *Used Numbers* took place in Boston area school systems and formal field tests were conducted in New York City, Georgia, Chicago, and Massachusetts in sites carefully chosen to maximize diversity. Schools included rural, urban, and suburban districts; the participation and achievement of girls, minority and bilingual students, as well as special education students was carefully evaluated. Pre- and post-tests were administered in students in grades 4 through 6 who had field-tested three units (*Shape of the Data; Prediction and Sampling;* and *Middles, Means, and InBetweens*). Findings showed that the students who used any of the three units made major gains in their understanding of the characteristics of a data set. Students also made substantial gains in the way that they represented data. Students experienced the greatest mastery of basic descriptive and representation skills, and less mastery of the problems that demanded more interpretation, extrapolation, and comparison.

MATERIALS AVAILABLE:

Counting: Ourselves and Our Families (grades K-1)—With this unit students use counting to collect data, which they then sort, group, display and discuss.

Sorting: Groups and Graphs (grades 2-3)—Students look for common attributes, develop categories which help them sort and describe sets of data, and construct graphs and diagrams which enable them to view and interpret the data they have collected.

Measuring: From Paces to Feet (grades 3-4)—Students use linear measurement to investigate characteristics of themselves and the classroom environment. They move from nonstandard to standard units of measurement as they collect, display, and interpret data.

Statistics: The Shape of the Data (grades 4-6)—Students learn about describing sets of data in order to interpret what the data show about the placement they represent.

Statistics: Prediction and Sampling (grades 5-6)—Students who have some previous work in data analysis gain experience in selecting samples, collecting

and displaying data from those samples, then interpreting what the data reveal about the population.

Statistics: Middles, Means, and Inbetweens (grades 5-6)—Students with experience collecting, describing, representing, and interpreting data are introduced to more formal statistical measures. The concept of the arithmetic mean (or "average") is developed through a series of carefully chosen experiences and concrete models. Students undertake an independent project in data analysis involving comparison and prediction.

Used Numbers Videotape (grades 4-6)—The 15-minute tape, illustrating an active mathematics classroom is an introduction to how the curriculum has been implemented and what teachers have to say about it.

CONTACT:

Dale Seymour Publications
P.O. Box 10888
Palo Alto, CA 94303-0879
1-800-USA-1100

TITLE OF PROGRAM:

Think About

SOURCE(S):

Produced for AIT by The Alberta Educational Communications Corporation; Educational Film Center, North Springfield, VA; KERA, Dallas; KETC, St. Louis; KOCE, Huntington Beach, CA; South Carolina ETV Network/South Carolina Department of Education; TV Ontario, Toronto; Utah State Board of Education with financial assistance from the Corporation for Public Broadcasting and Exxon.

AUDIENCE:

Grades 5-6

PROGRAM DESCRIPTION:

Think About is a series of audiovisual programs which use thinking skills as a common denominator to reinforce and develop skills in mathematics, language arts, and studying. Think About consists of 13 program clusters, each emphasizing one of the following thinking skills: Finding Alternatives; Estimating and Approximating; Giving and Getting Meaning; Collecting Information; Classifying; Finding Patterns; Generalizing; Sequencing and Scheduling; Reshaping Information; Judging Information; Communicating Effectively; Solving Problems. Between clusters there are special programs of tips and challenges which provide opportunities for problem solving and stimulation for independent thinking.

PRODUCTION DATE: 1979.

EVALUATION AND/OR COMMENTS:

Winner, ACT Achievement in Children's Television Award, 1979. Two CINE Golden Eagle Awards for programs 25 and 26, 1980. Bronze Award, International Film and TV Festival of New York for program 25, 1980. Certificate of Creative Excellence, U.S. Industrial Film Festive Association for program 13, 1980. Red Ribbon, American Film Festival for Program 26, 1981. Elected to School Television Hall of Fame, 1988.

MATERIALS AVAILABLE:

Guides

Videocassette

"About Think About"

Why Bother?—Kelly thinks "Why bother?" when the librarian suggests alternative sources for her report. But after falling asleep and meeting Dr. George Washington Carver in a dream, Kelly realizes the more alternatives, the better.

Brainstorming—Student council members generate useful alternatives to deal with a school vandal when they follow the four steps of the brainstorming process.

Blockbusting—A magician, a gymnast, a girl moving into a new room, and a boy who has lost his little brother all use blockbusting to solve their problems.

You can Remember!—Grouping (breaking a whole into parts) helps Peter learn his paper route. Officer Johnson stops a robbery by picturing (using her mind as a camera).

Estimating—Canoeists defeat older, stronger opponents in a race by using their heads and applying estimation skills.

Approximating—As Jan, Bill, and friends work on set, costumes, and sound effects for the school play, they discover the answer to the question: How close is close enough?

Using Estimating and Approximating—Using their skills of estimation (making a "best guess") and approximation (measuring), Vickie, David, and Grandma build and install plastic storm windows and insulate the attic.

Find Your Guide—The problem-solving guide *Hey Wait! Think, See, So?* is used by Alexander Graham Bell, some campers, a football team, and a babysitter. *Hey Wait!* (stop, you have a problem): *Think,* (of alternatives and select one); *See* (try your plan); *So?* (decide what to do next, if anything).

What's the Meaning?—After a misunderstanding, Alfie learns from an imaginary professor that communication involves a sender, a receiver, and information.

Meaning is More Than Words—Jody, Tina, Adam, and Dave learn how emphasis, intonation, context, pauses, and nonverbal behaviors affect communication.

Remember the Audience!—Three students, making a film their teacher can use on school visits abroad, remember that most of their audience speaks no English.

But, What Does It Mean?—Cathy and Diane, discussing and questioning as they read through old letters, piece together a moving and fascinating story.

The Bigger Picture—Taking something his mother says out of context, Danny thinks she wants to get rid of him. His experiences on a bus help him get the bigger picture.

Where Are You Coming From?—Three boys each get a note from their teacher: "See me after class on Friday." Their past experiences give each boy a different idea about what the teachers wants.

Make a Present for the Future—A boy and girl who live in the future find a time capsule prepared by young people from our age.

What Do I Know?—In the first problem-solving segment, a lost pup is returned home; in the second Pete and Marty think they see a UFO and want to prove it.

Where Should I Go?—Pete and Marty tap several useful information sources for clues to their UFO sighting.

What Should I Do?—The dietitian challenges three students to plan a cafeteria menu. Michael takes a student survey, Wayne examines past cafeteria sales, and Shelley tapes an interview on nutrition.

Ways To Remember—Cindy can't remember her Tai Chi moves, but her instructor's advice on remembering helps, and she even gives an oral report at school without using notes.

Classifying Objects—The Harris's garage sale is chaos until they close temporarily and arrange their wares in categories.

Classifying Information—Leah's report is "boring" and "mixed up" because she hasn't organized her information. After classifying her facts and making an outline, she writes a clear, interesting account.

Sterotyping People—Lisa classifies grandma as an "invalid old person" and treats her accordingly. Mom helps Lisa realize the thoughtlessness of sterotyping.

There Are Many Ways To Go—The problem-solving guide *Hey Wait! Think, See, So?* Is used by three young ice skaters preparing for a competition.

People Patterns—Richie's class studies regularities in the way people act or behave. When Mr. Harper fails to leave his apartment as usual, Richie checks on him and helps save his life.

Communication Patterns—The pretty new girl who has caught Roger's eye is hearing-impaired, so he learns so much about communication patterns that he's able to ask her to dance--in sign.

Cultural Patterns—Linda's older brother helps her realize that her dead grandfather and the family's Mexican-American cultural heritage live on in her recollection of the beautiful stories he told.

Nature's Patterns—Why have all the fish died in the farm pond? After careful experiments and observations, Susan and her cousin find the reason.

Search for the Unknown—Students are challenged to come up with their own explanations for the Loch Ness phenomenon or another mystery--Bigfoot or the Bermuda Triangle, for example.

Drawing Conclusions—Cliff must decide whether to stay home with Mom or go to England with Dad on an extended business trip.

Checking Conclusions—A junior high rock band thinks "looking good" is more important than playing well. After checking and revising their conclusions, they get to work on their musicianship.

Practice for Success—Jack is a skateboard whiz but a frustrated beginner at tennis. Home movies of himself remind him that skill requires time and practice.

One Step At a Time—Making a biographical movie about his grandfather, Rudy breaks the project into steps and delights his large Italian-Canadian family with the successful results.

Plan Ahead—Ralph, Bobby, Wilma, and Emma's secret project is finished just in time to cause assembled campers to break into startled cheers when a big paper "sea monster" glides across the lake.

Calm Your Jitters—Architect Nancy Austin recalls the math anxiety she experienced in the fifth grade, and how, with help from teachers, parents, and friends, she learned techniques fo overcoming anxieties.

What Are They?—Woody and Debbie discuss the word criteria as their stroll takes them past an abstract sculpture.

Where Do You Find Them?—Nervous about being judge in a soap-box racer-building contest, Larry tracks down criteria, hands the boys a list, and lets them do their own judging.

How Do You Change Them?—The girl's basketball team is torn by Ellie's and May's rivalry for team captain. Betsy and Laura work at a list of criteria for the position until everyone is satisfied.

Design a Language—After visiting with Bernard Bragg, distinguished deaf actor, teacher, and mime, Robin challenges students to try an exercise in which they invent their own language of hand gestures and facial expressions.

Symbols—Lee gets cards with mysterious symbols on them. She cracks the code and discovers a love message from an admirer.

More Than You Think—Alex thinks he doesn't have enough information to be fortune teller at the carnival or solve a word problem for mathematics class. In both cases he discovers that he knew more than he first thought.

Summarizing—With his team's help, paraplegic swimming coach Jess Coulter works up his resume and an attractive display of his "can do" lifestyle, and lands a job.

Maps and Models—A contour map and scale model of a pulley system help the Wranglers (younger boys and girls) rescue their cherished club emblem, stolen by the Avengers (older boys).

Get Ahead with Goals—By planning ahead and working toward his goal step-by-step, Leon finishes respectably in the local bicycle race.

Should I Believe It?—Sue, a student reporter, has carefully judged the reliability of her sources in an account of two purple visitors from space.

What's Important?—In a process that includes judging the importance of her clues, Christie solves the mystery of Sir Gordon Grendel's death.

What's Enough?—Bobby is sure that Eddy stole his bicycle, but when he gathers facts, he is surprised to learn where they lead.

Point of View—Joey thinks the new park is great, but Michael hates it because his house was torn down to make way for it.

Persuasive Techniques—When Wes's teacher explains card stacking, emotional words, and "everybody's doing it," he realizes that his friends have been using those techniques to persuade him that Allen is no longer their friend.

Make a Deal With Yourself—Duncan is talented but undisciplined musician who'd rather "just play" than practice. When he schedules little rewards for diligence on his calendar, he begins making real progress.

Styles of Communication—Three young people learn that a polite, specific complaint is much more effective than angry accusations.

Planning a Presentation—When their dog is threatened by rabies, Brenda and Steve campaign to get pets vaccinated. They decide *whom* to warn, *what* to say, and *how*, then present their case.

Making a Presentation—Some bigoted girls make fun of Shannon in her new school. She polishes her oral presentation skills and wins the school speech contest with a speech on her proud Navajo heritage.

Making Your Point—Flash and T.J. set out to convince the basketball coach that Flash should be on the team. After a well-organized oral presentation, they clinch their points in a two-on-two with the coach and another player.

Making It Come Alive—Heather's ballet dancing looks mechanical, but a teacher and an older dancer help her discover that creative expression depends on the artist's sincere involvement.

Make Something New—Woodworking, pottery, puns, and riddles; an ingenious tent; roller skates made out of old sneakers--young people use objects, machines, words and their imaginations to make new things, and then challenge viewers to do the same.

One Thing Leads To Another—The Rocket Babysitting Service learns about the price of success when first they need a new phone, then they have to raise their rates, then they start to lose customers.

A Matter of Time—Pilot Susan Carpenter, Kathy, Colleen, and Roxie are in a plane crash in dense woodland. Susan is injured; night is closing in. The girls have some fast decision making to do.

There's Always a Risk—Colleen and Roxie risk hiking for help, while Kathy turns on the wrecked plane's emergency locator. Abe and Jim start picking up a mysterious tone on Abe's new multiband.

Hanging in There—Roxie and Colleen find themselves in a ghost town, but they don't give up. Meanwhile Abe runs down the explanation for the strange tone: a distress signal! All four crash victims are soon rescued.

Plan a City of the Future—Young people talk about ideas for future cities--rebuilt urban centers, Solen's "arcologies," colonies in the oceans and outer space. Then they challenge viewers to conceive and design their own city of the future.

CONTACT:

AIT Instructional Services
Box A
Bloomington, IN 47402
1-800-457-4509

Selected Promising and Exemplary Materials for Middle, High School, and College

TITLE OF PROGRAM:

The Algebra Project

SOURCE(S):

New Jersey Department of Higher Education, New Jersey Department of Education, Rutgers University, Ford Foundation

AUDIENCE:

Middle/High School

PROGRAM DESCRIPTION:

The Algebra Project curriculum is designed to develop in students the capability to do quantitative reasoning, that is, problem solving. To accomplish this students must acquire three basic abilities: the ability to analyze a situation/problem to decide what needs to be found and to verbalize an approach and translate into symbolic form; the ability to solve the equation(s); and the ability to interpret and assess results. The teaching approach is student centered. Discovery and student discussion are encouraged. Homework problems are sequenced to build quickly in difficulty to avoid compartmentalizing knowledge. One of the major components of the Algebra Project is the teacher training program. For teachers new to the project four days in the summer are required and six more days throughout the school year. Experienced teachers conduct the workshops to explain the philosophy, approach and materials, sequencing, pacing, discovery, homework, and independent learning.

PRODUCTION DATE: 1984.

EVALUATION AND/OR COMMENTS:

Studies using the pre- and post-tests of New Jersey College Basic Skills Placement Test (NJCBSPT) involving pilot and control groups indicate that students in the Algebra Project learn algebra more successfully than do those in the traditional curriculum. This program was in use in 1990, in 67 public school districts in 18 counties and 9 nonpublic schools.

MATERIALS AVAILABLE:

Project Algebra book (paper back)
Teacher training program

CONTACT:

Laurie Fitchett, Coordinator
The Algebra Project
Room 206, Smith Hall
Rutgers, The State University
Newark, NJ 07102
(201) 648-1041

TITLE OF PROGRAM:

Applied Mathematics

SOURCE(S):

The Center for Occupational Research and Development (CORD), Waco, TX with funding from 41 State Vocational Education Agencies

AUDIENCE:

Grades 9-12

PROGRAM DESCRIPTION:

Applied Mathematics is designed for the middle fifty percent of the school population. The curriculum emphasizes the practical applications of academic mathematical skills and problem solving skills. There are 22 instructional units and 3 review units. Topics include: Getting to Know Your Calculator; Naming Numbers in Different Ways; Finding Answers with Your Calculator; Learning Problem Solving Techniques; Estimating Answers; Measuring in English and Metric Units; Using Graphs, Charts, and Tables; Dealing with Data; Working with Lines and Angles; Working with Shapes in Two Dimensions; Working with Shapes in Three Dimensions; Using Ratios and Proportions; Working with Scale Drawings; Using Signed Numbers and Vectors; Using Scientific Notation; Precision, Accuracy, and Tolerance; Solving Problems with Powers and Roots; Using Formulas to Solve Problems; Solving Problems That Involve Linear Equations; Graphing Data; Solving Problems That Involve Nonlinear Equations; Working with Statistics; Working with Probabilities; Using Right-triangle Relationships; Using Trigonometric Functions. Each unit is an integrated learning package made up of: a video program, text, mathematics laboratory activity, practical problem solving exercises, and glossary. Each unit has six activity sessions, not necessarily equating to six class periods. Session 1 involves viewing the video and working as a group to solve a problem posed. Sessions 2 and 3 involve reading, doing and discussing text and classroom activities. Session 4 and 5 involve cooperative laboratory work using hands-on materials. Session 6 includes reviewing the unit objectives and the videotape.

PRODUCTION DATE: 1988.

EVALUATION AND/OR COMMENTS:

The effectiveness of Applied Mathematics has been evaluated by Texas A and M University as well as evaluation conducted by many consortium member states.

In the second year of the program, it is estimated that Applied Mathematics is being offered at over 1200 sites within the 44 consortium states—involving over 30,000 students.

CORD is in the process of developing a 2nd year of Applied Mathematics to be available in the Fall of 1991.

MATERIALS AVAILABLE:

List of Unit Objectives

Implementation Resource Notebook

Descriptive Brochure

Overview Video

Individual Student Texts

Videotapes

Teacher's Guides

(Curriculum may only be taught in schools within consortium member states or schools licensed to do so)

CONTACT:

Dr. Leno S. Pedrotti
The Center for Occupational Research and Development
601-C Lake Air Dr.
Waco, TX 76710
(817) 772-8756
1-800-231-3015

TITLE OF PROGRAM:

Contemporary Precalculus through Applications (formally Introduction to College Mathematics or ICM)

SOURCE(S):

North Carolina School of Science and Mathematics, Durham, NC; Carnegie Corporation of New York; and the National Science Foundation

AUDIENCE:

Grades 11-12

PROGRAM DESCRIPTION:

Contemporary Precalculus through Applications uses extensive investigations of real problem applications in engineering, business, science, and computer science to prepare students for diverse future mathematics courses in calculus, finite mathematics, discrete mathematics, mathematical modeling, and statistics. Calculators and computers are used as tools for problem solving and exploration. Six themes (mathematical modeling, computers and calculators as tools, applications of functions, data analysis, discrete phenomena, and numerical algorithms) are spiraled throughout the course increasing in breadth and depth. Specific units include: Geometric Probability; Data Analysis I; Functions; Finance; Models 1; Data Analysis 2; Models 2: More Advanced Applications; Trigonometry 1; Inverse Trigonometric Functions and a Model; Matrices; Algorithms 2; and an Appendix: Additional Topics in Data Analysis.

PRODUCTION DATE: 1989.

EVALUATION AND/OR COMMENTS:

Grants provided by NSF and the Carnegie Corporation of New York.

MATERIALS AVAILABLE:

Course materials and four diskettes of IBM-compatible software are available from NCSSM for $25.

Versions of three units: Data Analysis, Geometric Probability, and Matrices are available from National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091

Janson Publications will publish the materials as a precalculus textbook, Spring 1991.

CONTACT:

Helen Compton
North Carolina School of Science and Mathematics
P.O. Box 2418
Durham, NC 27705
(919) 286-3366

TITLE OF PROGRAM:

Early Placement Evaluation in Mathematics (EPEM)

SOURCE(S):

Department of Mathematics, Oklahoma State University, Stillwater, OK with funding from Oklahoma State Regents for Higher Education

AUDIENCE:

Grade 11

PROGRAM DESCRIPTION:

EPEM is an early intervention mathematics program aimed at juniors. The purpose is to encourage stronger mathematics preparation in the public schools. Each participating student gets an assessment of his/her algebra preparedness. In addition each student is provided with a summary of math needs for various college programs. EPEM provides a forum for articulation between high schools and colleges on math preparation issues.

PRODUCTION DATE: 1988.

EVALUATION AND/OR COMMENTS:

Evaluation is in process. Enrollment patterns of participating schools are being studied. The level of participation and acceptance of the EPEM program (which is voluntary) seems to indicate that the program serves an authentic need. In 1989-90 19% of the state's juniors and 12% of the sophomores participated in this program. Enrollment over a three-year period has increased as follows: 1988, 4 schools and 740 students; 1989, 50 schools, 8,528 students; 1990, 104 schools, 13,682 students.

MATERIALS AVAILABLE:

EPEM Brochure

High School Math Preparation Booklet

Sample EPEM Test Reports

EPEM Newsletter

CONTACT:

John Wolfe
Department of Mathematics
Oklahoma State University
Stillwater, OK 74078
(405) 744-5781

TITLE OF PROGRAM:

Fifth-Year Math Program

SOURCE(S):

Enterprise High School, Enterprise, Alabama with funding from local, state, and federal sources.

AUDIENCE:

Grades 11-12

PROGRAM DESCRIPTION:

The Fifth-Year Math Program includes a semester of analytic geometry and a semester of various topics including set theory, statistics, probability, series, sequences, the binomial theorem, groups, and BASIC programming as a tool to study mathematics. Students are required to write a mathematical research paper, to develop a visual project, and to make a class presentation. Teachers must be experienced in computer science, advanced mathematics, and with research topics appropriate for the secondary level. Many diverse instructional strategies are used including lectures, demonstration, cooperative learning, computer lab, library research, and the use of media materials.

PRODUCTION DATE: 1982.

EVALUATION AND/OR COMMENTS:

Students involved in this program have consistently indicated a positive attitude toward higher mathematics, and provide positive evaluations of their course work.

Student achievement in school mathematics has increased. Student enrollment in advanced mathematics classes has increased. This program was nominated by the Appalachia Educational Laboratory, Inc., based on feedback from curriculum specialists and supervisors.

MATERIALS AVAILABLE:

Text used: *Analytic Geometry*, Addison Wesley; Shaum's *Analytic Geometry; Advanced Mathematics Concepts*; Merrill; *College Algebra and Trigonometry*, Brooke and Coles Publishers, *Principles of Advanced Math*, L. W. Singer, BASIC programing requirements, graphing calculators and many A-V materials are employed to complement this exploration of Mathematical concepts.

CONTACT:

Katharine Price
(Rick Reiner)
500 E. Watts Ave.
Enterprise, AL 36330
(205) 347-2640

TITLE OF PROGRAM:

Math A - Fresno Unified School District

SOURCE(S):

Fresno High School, Sequoia Freshman High School

AUDIENCE:

Grades 9-12

PROGRAM DESCRIPTION:

Math A is an activity-based high school mathematics course for students in the middle range of abilities. This program offers a practical, concrete approach to strands of mathematics. Much of the content covers topics in introductory algebra and geometry, so that some students may make the transition to the college-preparatory sequence. Teachers use a variety of instructional strategies. Students engage in cooperative learning situations using manipulative materials. Lessons frequently involve the use of empty jars, string, homemade alidades or transits, calculators, algebra titles, number chips, dice, measuring tapes, meter sticks, or grid paper. Classroom sets of calculators are provided, and computational skills are reinforced in the context of applications. Problem solving opportunities are diverse; in many instances, there is no single or correct answer. Teacher inservice training in all mathematics strands in the summer is provided. Teachers from eight high schools participate and are interviewed during the school year. Skill review takes place in activity-type lessons that integrate concepts and strands.

PRODUCTION DATE: 1989.

EVALUATION AND/OR COMMENTS:

Criterion-referenced tests are used for ongoing and final evaluation. Attitude surveys are used with teachers and students. CAT and CAP are used for formative data.

MATERIALS AVAILABLE:

Introduction to Calculators, Unit 1 (Teacher's and Student's Packet)
Problem Solving, Unit 2 (Teacher's and Student's Packet)
Logic, Unit 3 (Teacher's and Student's Packet)
Measurement, Unit 4 (Teacher's and Student's Packet)
Algebra, Unit 5 (Teacher's and Student's Packet)
Algebra, Unit 6 (Teacher's and Student's Packet)
Geometry, Unit 7 (Teacher's and Student's Packe.)
Algebra, Unit 8 (Teacher's and Student's Packet)
Algebra, Unit 9 (Teacher's and Student's Packet)
Algebra, Unit 10 (Teacher's and Student's Packet)
Probability & Statistics, Unit 11 (Teacher's and Student's Packet)
Probability & Statistics, Unit 12 (Teacher's and Student's Packet)
Algebra, Unit 13 (Teacher's and Student's Packet)
Math, Unit 14 (Teacher's and Student's Packet)
Geometry, Unit 15 (Teacher's and Student's Packet)
Geometry, Unit 16 (Teacher's and Student's Packet)
Math, Unit 17 (Teacher's and Student's Packet)

CONTACT:

Linda Dritsas, Secondary Mathematics Coordinator
Fresno Unified School District, Education Center
Tulare and M Streets
Fresno, CA 93721
(209) 441-3642

TITLE OF PROGRAM:

Practical Mathematics I and II

SOURCE(S):

The School District of Greenville County, Greenville, SC with funding from local and state sources.

AUDIENCE:

Grades 9 and 10 (Remedial)

PROGRAM DESCRIPTION:

Practical Mathematics I and II are designed to prepare students for vocational education using applications of mathematics. A comprehensive view of mathematics consisting of concepts, operations, measurements, and problem solving provides the basis of the course. A dropout prevention component is directed toward at-risk students. Students use computers, calculators, Dukane projectors, metric and customary measuring devices as well as a variety of manipulatives. Students must attend classes daily and be enrolled in a vocational or prevocational program.

PRODUCTION DATE: 1989.

EVALUATION AND/OR COMMENTS:

Students have shown improved attitudes towards mathematics, have had increased achievement in mathematics courses, and have increased awareness of careers in mathematics. In addition, minorities and females have enrolled in higher level mathematics course more frequently. Teachers have become more aware of student difficulties in learning mathematics and have increased experience teaching in a laboratory situation.

MATERIALS AVAILABLE:

Practical Mathematics I

This remedial program for students who have severe deficiencies in basic skills emphasizes operations on whole numbers, fractions, decimals, and introduces percent and integers with simple, relevant applications. The content includes concepts, operations, geometry, measurement, and problem solving at appropriate levels.

Practical Mathematics II

This remedial program for students who have severe deficiencies in basic sills emphasizes operations on fractions and decimals and presents percent, integers, and statistics with simple, relevant applications. The content includes concepts, operations, geometry, measurement, and problem solving at appropriate instructional levels.

CONTACT:

Linda Gunnells
The School District of Greenville County
P.O. Box 2848
Greenville, SC 29602
(803) 241-3203

TITLE OF PROGRAM:

Teaching Remedial Mathematics to Students with Learning Disabilities

SOURCE(S):

Queensborough Community College of the City University of New York with a grant from the US Department of Education

AUDIENCE:

College (can be adapted to secondary)

PROGRAM DESCRIPTION:

Teaching Remedial Mathematics to Students with Learning Disabilities is a program designed to assist instruction personnel help students with special learning problems. Specific strategies are provided to help students understand and apply algorithmic procedures; interpret problems and questions correctly; choose appropriate strategies for solving problems; translate word problems into symbolic representation; check answers in a manner appropriate to the problem; organize work in a written form which is clear and efficient; understand the rules of logic; observe patterns and relationships; generalize problem solving strategies from one example to another; develop compensatory strategies. As part of the curriculum modification 370 examples of problems from arithmetic and algebra were chosen. Analysis was done for each a task including its description, concepts embedded within it, prerequisite and general skills required to do it, introductory and motivational ideas, and strategies which would be helpful to compensate for student deficiencies and learning difficulties.

PRODUCTION DATE: 1986.

EVALUATION AND/OR COMMENTS:

Has been invited to and spoken at conferences of national organizations such as: American Council on Learning Disabilities and National Council of Teachers of Mathematics.

MATERIALS

A Guide for Teaching Remedial Mathematics to Community College Students with Learning Disabilities

CONTACT:

Professor Sandra Peskin (or Dr. Juliana Corn)
LD Math Project
Department of Mathematics, Room S-245
Queensborough Community College
Bayside, NY 11364
(718) 631-6361

TITLE OF PROGRAM:

University of Chicago School Mathematics Project

SOURCE(S):

University of Chicago with funding from Amoco Foundation, Ford Motor Company, Carnegie Corporation of New York, General Electric Foundation

AUDIENCE:

Middle and High Schools

PROGRAM DESCRIPTION:

UCSMP is an innovative mathematics program developed in response to criticisms of mathematics education in the United States. It was founded on the beliefs that: (1) mathematics is valuable to the average citizen; (2) virtually every student can learn a significant amount of mathematics; (3) huge numbers of students leaving high school are ill-prepared in mathematics for the activities they will undertake; (4) we can learn from other countries; (5) a major cause of the problem lies in the curriculum; (6) a major deficiency in the curriculum is that time is wasted by underestimating what students know when they enter the classroom and needlessly reviewing what students have already learned; (7) calculators and computers make some content obsolete, make other content more important, and change the ways in which we should view still other content. They also give us new possibilities for instruction: (8) mathematics is more than arithmetic, algebra, geometry and calculus; (9) the classroom should not be divorced from the real world; (10) to make significant change in any school, teachers and administrators must work together; (11) performance does not always coincide with our subjective impressions of it; impartial examinations of our work are necessary; (12) we cannot do it alone. We need help from the entire education community. Several features are common to all materials: wider scope, reading and problem solving, applications, use of technology, multi-dimensional approach to understanding and a unique instructional format. In particular statistics, probability, algebra, geometry and discrete mathematics are integrated within each course. Applications are used to introduce lessons, to motivate, to challenge, and to provide real uses of mathematics. Students develop understanding of content through experiences with skills, properties, uses and representations (SPUR). Each lesson contains a reading section, a "cover the reading", an "apply the reading", review and exploration. Through reading and self-diagnosis students are encouraged to become independent learners.

PRODUCTION DATE: 1985.

EVALUATION AND/OR COMMENTS:

Several evaluation studies have been completed on *University of Chicago School Mathematics Program* (UCSMP) materials. In 1987-88 a formative evaluation of UCSMP Advanced Algebra was conducted with a third version of these materials. Five schools (two in Chicago, two in a suburban working-class community, and two in more affluent suburbs) were involved. Typical second-year classes were used. A similar number of comparison classes were selected and tested. Overall, UCSMP students scored 15.6 percent higher than the comparison students. Also in 1987-88, a carefully controlled study involving 40 matched pairs of classes in nine states , half using UCSMP Algebra and half using algebra texts, were studied. Students were given three tests, the first being the American Testronics High School Subjects Test: Algebra, and two additional tests. Independent evaluators found that on no subtest did the comparison classes score higher than the UCSMP students, concluding that the student achievement data could be interpreted as a fairly strong statement in

favor of UCSMP Algebra. Additional data were available relative to UCSMP Geometry and Transition Mathematics. One study of Transition Mathematics reports "...students outperformed comparison students significantly in geometry and algebra readiness, and also became effective calculator users without a deterioration in their arithmetic skills."

MATERIALS AVAILABLE:

Transition Mathematics applied arithmetic, pre-algebra, pre-geometry.

Algebra includes geometry, probability and statistics and exponential functions.

Geometry with coordinates and transformations; area and volume presented early; proof delayed.

Advanced Algebra assumes and uses geometry, graphical techniques, matrices, and introduction to trigonometry.

Functions, Statistics, and Trigonometry with Computers includes special projects in each unit.

Pre-calculus and Discrete Mathematics includes special projects in each unit as well as original readings in mathematics.

CONTACT:

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University of Chicago Judd Hall
5835 S. Kimbark Avenue
Chicago, IL 60637
(312) 702-1560

Summary

The generalizations and comparisons that follow are based on the information and materials that were available at the time the project was underway. The possibility always exists that additional materials, and information, exist elsewhere that might cause different comparisons to be made. Numerous attempts were made, during this two-year project, to obtain as much information as possible and we are grateful for the persons associated with the various programs who were willing to dig into their files and share information with us.

This is a diverse collection of programs and materials, developed by a variety of groups in different locations. A companion document, describing exemplary science programs, has also been produced. Some comparisons between publications will be made, but the discussion that follows will be focused on the information contained in this publication.

A few programs and materials emphasized interdisciplinary teaching, primarily with science and/or technology. (Such programs and materials are described in both documents.) A number of mathematics programs emphasized mathematics laboratory activities, promoting student involvement as opposed to the stereotypic picture of mathematics classes in which students individually work on practice sets of problems reinforcing strategies the teacher has just illustrated with examples on the board or overhead. Also in contrast to this stereotyped view of the teaching of mathematics, several programs stressed the use of cooperative learning groups as an instructional strategy as well as emphasizing the necessity for promoting discussion among students.

A major theme in many of the mathematics programs was that of problem solving. Also, program descriptions stressed the application of problem solving skills to problems that were real to children. In addition to paper and pencil materials, problem situations were posed and/or illustrated through the use of audiovisual materials, usually videotapes.

Computer-assisted instruction was a major part of several programs. In addition, several programs emphasized computer management systems designed to help classroom teachers with the sequencing and assessment of instruction.

At least three programs (*Project SEED, Add-Ventures,* and *EQUALS*) were focused on helping teachers encourage all students, but particularly females and minorities, to develop positive attitudes about mathematics. Several program descriptions contained the phrase 'student centered teaching' and at least two (*Math Their Way, Jostens Learning Mathematics Curriculum*) reflected the influence of Jerome Bruner in their discussion of instruction moving from concrete or inactive to iconic to symbolic levels as students progressed through the elementary grades.

The mathematics programs differed from those in science in that a number of the elementary programs identified for this document were targeted to a specific grade level rather than across grade levels. Among the programs identified, there was no discernible bias to target the materials for a particular group of students based on achievement in mathematics. However, several programs (*Project Catch-Up, Practical Mathematics I & II, Project SEED*) were designed to encourage low achievers and educationally disadvantaged students to persist in mathematics study. One college program as designed for college students with learning disabilities and contains a task analysis of 370 examples of problems from arithmetic and algebra. Two programs (*Applied Mathematics; Math-A, Fresno Schools*) were described as being designed for middle range ability students.

Although all education has as one of its objectives to prepare students for the future, several mathematics programs interpreted this objective in various ways. One (*Early Placement...*) involved the assessment of algebra preparedness of high

school juniors and summarized the mathematics needs for various college programs. Another (*Contemporary Precalculus...*) used real problem applications from engineering, business, science, and computer science to prepare high school juniors and seniors for diverse future mathematics courses. A third (*Fifth Year Math Program*) involves a semester of analytic geometry and a semester of various topics and calls for special teacher preparation to handle the diversity of the program.

Only a few mathematics program descriptions contained information on teacher preparation to teach the material involved. Most were focused on topics and supporting materials.

The programs and materials contained in this collection of exemplary mathematics ideas are classified as elementary, secondary, and K-12. The majority fit into the elementary category. The few that were identified as involving middle school students were categorized by their authors as middle/high school. Based on this collection of materials, it does not seem that mathematics educators believe that the special characteristics of pre- and early adolescents call for mathematics activities especially tailored to this age group. Only one such program (Link) was identified for this document. In some cases what is identified as a program appears to be more a philosophical approach or an instructional model rather than a course of study. Overall, the concern appears to be to make mathematics more appealing to all students in order to achieve the goal stressed in the *University of Chicago School Mathematics Project* - that of developing mathematics literacy.

SELECTED INFORMATION SOURCES

EPIE Institute
103 W. Montauk Highway
Hampton Bays, NY 11946
(516) 728-9100

National Diffusion Network
555 New Jersey Avenue, NW
Washington, DC 20208-1525
(202) 219-2134

National Science Foundation
Division of Materials Development,
Research and Informal Science Education
1800 G Street, NW
Washington, DC 20550
(202) 357-7536

Northwest Regional Educational Laboratory
101 Southwest Main Street - Suite 500
Portland, OR 97204
(503) 275-9500

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Education Programs That Work: A Collection of Proven Exemplary Educational Programs and Practices. Edition 14. Sopris West Incorporated, Longmont, CO, 1988. ED 296 984.

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Levinson, Luna Lambert, ed. *Abstracts of the 1989 and 1988 Awards: Dwight D. Eisenhower Mathematics and Science National Programs*. Office of Educational Research and Improvement, U.S. Department of Education, Washington, DC, 1989. SE 051 024.

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